Respecting Mother Nature

Wilko Koop, A.Hak, the Netherlands, explains the development of a drilling technique that can avoid damaging fragile environments.

Dutch pipeline contractor A.Hak is a strong promotor of the Direct Pipe drilling technique in onshore applications, with one of its main advantages being the reduced environmental impact, in comparison to other techniques. By cleverly combining onshore and offshore techniques, A.Hak is now at the forefront by further developing the Direct Pipe technology as a safe and environmentally friendly technique for landfalls, steering clear of the most fragile parts of the shoreline and limiting diving hours to a minimum. In this article, A.Hak shares its insights and an outlook on the further possibilities of the application of this technology.

The case

Offshore pipeline and dredging companies often face challenges when they want to land a pipeline at the shore, one of them being environmental requirements. In the Leviathan project at the coast of the Mediterranean Sea in Israel, turtles were in play. The shore of Israel near Dor, between Haifa and Tel Aviv, is the breeding ground for beautiful turtles that lay their eggs in the sand on the beach. As a result, it is no surprise that this area is an environmentally protected zone that does not allow any form of disturbance at the beach or near the shoreline.

Figure 1. Installing A.Hak 56 in. clamp on thruster.

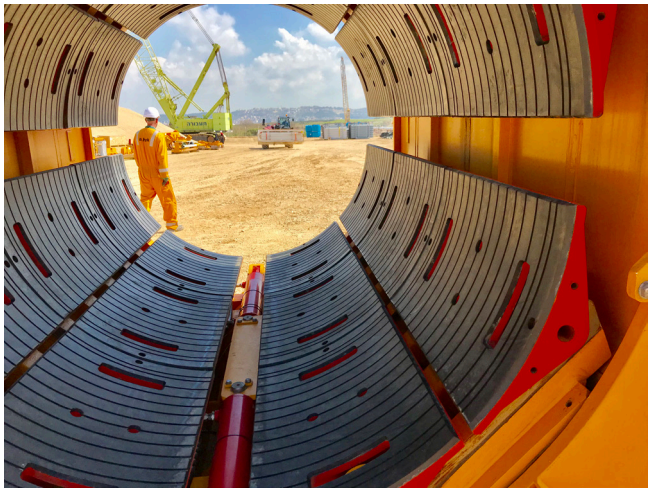

Figure 2. A.Hak 56 in. clamp with rubber inlets.

At the time of the tender, the existing techniques did not provide any suitable solution to get the pipeline onshore without disturbing the environment. Dredging was not allowed, microtunnelling did not meet the schedule, and the disadvantages of a HDD were numerous: too many activities on the shore, risks of bentonite spills, and overall too much disturbance for the animals and their habitat. A technically robust solution had to be developed to bring the 32 in. gas pipeline, together with a 6 in. condensate pipeline, to the onshore facility.

Allseas invited A.Hak in a feasibility study to find out whether there were any new solutions to approach the shore without impacting the environment but still meeting the hard demands of constructability, to avoid any risk of disturbing the challenging schedule of the offshore activities. This early involvement of A.Hak, one of the major cross-country pipeline and trenchless crossing specialists in the world, meant that they were able to work collaboratively with all other parties and bring together the strengths of both the onshore and offshore oriented companies involved. A.Hak researched, together with Allseas, the feasibility of a Direct Pipe landfall for almost two years. This process resulted in a design solution of a 56 in. conduit pipe with a minimum length of 1100 m. Despite the fact that this was the first time the technology would be used for a landfall of this size, A.Hak was convinced that this solution was the best drilling method. Additionally, the use of a conduit pipe eliminated the critical interface between onshore and offshore by disconnecting the landfall and pipelaying activities.

The early involvement, the co-operation with engineers of all associated parties, together with the local Israeli supply chain, and the in-depth work preparation and risk mitigation sessions, all contributed to the successful result for everyone.

Flawlessly, ahead of schedule, without any disturbance-related complaints from any party and, most importantly, where it all began: no unhappy turtles.

How does the technique work?

As equipment manufacturer and designer of the Direct Pipe technology, Herrenknecht accurately describes in the December edition of *World Pipelines* how the Direct Pipe technique combines HDD and microtunnelling. A tunnel boring machine (TBM) is welded directly to the product pipe and a Pipe Thruster pushes them forward. Unlike HDD, Direct Pipe completes the insertion of the pipeline in one single step. Direct Pipe does not only allow to push short sections of pipe, but is ideal for long, prefabricated pipe strings. On top of that, Direct Pipe does not require a deep launch shaft: generally, a shallow pit facing slightly downward to match the entry angle of the bore hole is sufficient. The drive always takes place from onshore, which enables the team to leave the shore untouched. Additionally, offshore activities during the drilling activities are not required – which is often one of the restrictions for receiving a permit to drill in protected areas.

Especially in sensitive coastal areas, the technique has the major advantage that all the tunnelling and installation is underground. Despite the fact that the Direct Pipe landfall had never been executed, the team was convinced that it was the only solution and that they would be able to achieve it.

Safe application

The collaborative research of the parties involved not only enabled A.Hak to pursue the project and complete it successfully, it also made it possible to work much more safely than in earlier projects in which the Direct Pipe technique was applied. Joint research showed that a larger than required diameter of the conduit pipe would improve the safety of the drilling personnel dramatically. So instead of the required 48 in., A.Hak chose 56 in.

A robust pipe with a large diameter proved to be a more secure option in combination with the tough geological specifications onsite. The larger TBM required has much more power and therefore much more margin to deal with adverse geology.

Using a larger pipe was also a better option because of the limited space available to string the pipelines together. A large diameter pipe made it easier and safer for personnel that had to work from within the pipe. When needed, they benefitted from a much less confined workspace.

Usually the construction of a landfall requires many hours of diving, in the case of Direct Pipe landfalls. This involves disconnecting the TBM after completion of the drilling. Diving is per definition a hazardous activity, and as an employer A.Hak is always focused on reducing risks for its personnel. By limiting the diving operations to only the recovery of the TBM, and by making the disconnecting of the TBM as simple as possible, A.Hak managed to reduce the diving scope to 15% of what would have been necessary in the original plan. To A.Hak, this has been a major and very important step forward, since it enables them to create a much safer environment for their team members.

Figure 3. A.Hak 2 × 750 t Direct Pipe set in operation.

Worldwide projects

Coincidently, in the same year that A.Hak created the first Direct Pipe landfall of this size, two similar projects were executed in other parts of the world: in Mexico in the Sur de Texas-Tuxpan project and in New Zealand at the Army Bay Waste Water Treatment Plant. These projects were also executed successfully – proof that the Direct Pipe landfall technique works in a variety of circumstances and settings. For example, in the Sur de Texas-Tuxpan project, the weather conditions in the Gulf of Mexico were extremely fluctuating. Thanks to the very limited offshore work, the weather was far less of an issue than it would have been with a different technique such as microtunnelling. It meant far fewer delays and extra costs.

Next steps

Direct Pipe is now a proven concept for landfalls. A.Hak would like to take it to another level, since it can also be applied in other hazardous or extreme situations – for instance, riverbeds with a protected environmental status, permafrost or deserts. The success of the landfall creates a world of opportunities for areas that are hard to reach, sensitive or protected by nature. As a bonus for the successful completion of the mentioned Leviathan landfall in Israel, A.Hak has been directly awarded with exactly the same landfall drilling close to the recently-completed project.

Conclusion

In order to receive a permit to drill in environmentally protected areas there are a large number of strings attached – and for good reasons. There is a considerable quantity of impressive nature that one does not want to damage in any way. Over recent years, there has therefore been a growing understanding of the importance to protect the planet's beautiful nature. Corporate social responsibility has become a key aspect of any business, and certainly also in the onshore and offshore industry.

At the same time, pipeline projects still need to be constructed, sometimes in these protected areas. This has resulted in the cross-pollination of onshore and offshore techniques, which is potentially one of the key reasons that A.Hak managed to create this landfall. It meant that the company had to look elsewhere and further develop a technique that was already in use in the onshore world. To A.Hak, it shows that real creativity and innovation lies in connecting dots that were never connected before.

Direct Pipe is a very promising technique. It does not damage the environment and it has an extremely small footprint, which makes it one of the best ways to respect nature whilst still getting the work completed.